TOXECON RETROFIT FOR MERCURY AND MULTI-POLLUTANT CONTROL ON THREE 90 MW COAL FIRED BOILERS

Quarterly Technical Progress Report
Reporting Period: July 1, 2004 – September 30, 2004

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ABSTRACT

With the Nation's coal-burning utilities facing tighter controls on mercury pollutants, the U.S. Department of Energy is supporting projects that could offer power plant operators better ways to reduce these emissions at much lower costs. Sorbent injection technology represents one of the simplest and most mature approaches to controlling mercury emissions from coal-fired boilers. It involves injecting a solid material such as powdered activated carbon into the flue gas. The gas-phase mercury in the flue gas contacts the sorbent and attaches to its surface. The sorbent with the mercury attached is then collected by a particle control device along with the other solid material, primarily fly ash.

We Energies has over 3,200 MW of coal-fired generating capacity and supports an integrated multi-emission control strategy for SO_2, NO_x and mercury emissions while maintaining a varied fuel mix for electric supply. The primary goal of this project is to reduce mercury emissions from three 90 MW units that burn Powder River Basin coal at the We Energies Presque Isle Power Plant. Additional goals are to reduce nitrogen oxide (NO_x), sulfur dioxide (SO_2), and particulate matter (PM) emissions, allow for reuse and sale of fly ash, demonstrate a reliable mercury continuous emission monitor (CEM) suitable for use in the power plant environment, and demonstrate a process to recover mercury captured in the sorbent. To achieve these goals, We Energies (the Participant) will design, install, and operate a TOXECON™ (TOXECON) system designed to clean the combined flue gases of units 7, 8, and 9 at the Presque Isle Power Plant.

TOXECON is a patented process in which a fabric filter system (baghouse) installed down stream of an existing particle control device is used in conjunction with sorbent injection for removal of pollutants from combustion flue gas. For this project, the flue gas emissions will be controlled from the three units using a single baghouse. Mercury will be controlled by injection of activated carbon or other novel sorbents, while NO_x and SO_2 will be controlled by injection of sodium based or other novel sorbents. Addition of the TOXECON baghouse will provide enhanced particulate control. Sorbents will be injected downstream of the existing particle collection device to allow for continued sale and reuse of captured fly ash from the existing particulate control device, uncontaminated by activated carbon or sodium sorbents.

Methods for sorbent regeneration, i.e. mercury recovery from the sorbent, will be explored and evaluated. For mercury concentration monitoring in the flue gas streams, components available for use will be evaluated and the best available will be integrated into a mercury CEM suitable for use in the power plant environment. This project will provide for the use of a novel multi-pollutant control system to reduce emissions of mercury while minimizing waste, from a coal-fired power generation system.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Wisconsin Electric Power Company (We Energies) signed a Cooperative Agreement with the U.S. Department of Energy (DOE) in March 2003 to fully demonstrate TOXECON™ for mercury control at the We Energies Presque Isle Power Plant. The primary goal of this project is to reduce mercury emissions from three 90 MW units (Units 7, 8, and 9) that burn Powder River Basin (PRB) coal. Additional goals are to reduce nitrogen oxide (NO_x), sulfur dioxide (SO_2), and particulate matter (PM) emissions, allow for reuse and sale of fly ash, demonstrate a reliable mercury continuous emission monitor (CEM) suitable for use in the power plant environment, and demonstrate a process to recover mercury captured in the sorbent.

We Energies has teamed with ADA-ES Inc. (ADA-ES) and Cummins and Barnard Inc. (C&B) to execute this project. ADA-ES is providing engineering and management on the mercury measurement and control systems. Cummins & Barnard is the engineer of record and will be responsible for construction, management and start-up of the TOXECON™ equipment.

This project was selected for negotiating an award in January 2003. Preliminary activities covered under "Pre-Award" provision in the Cooperative Agreement began in March 2003. This quarterly report summarizes progress made on the project from July 1, 2004 through September 30, 2004. During this reporting period, work was conducted in Tasks 4, 5, 6, 7, 8, 9, 17 and 19.

INTRODUCTION

DOE awarded Cooperative Agreement No. DE-FC26-04NT41766 to We Energies to demonstrate TOXECON™ for mercury and multi-pollutant control, a reliable mercury continuous emission monitor (CEM), and a process to recover mercury captured in the sorbent. Under this agreement, We Energies is working in partnership with the DOE.

Quarterly reports will provide project progress, results from technology demonstrations and technology transfer information.

Project Objectives

The specific objectives of this project are to demonstrate the operation of the TOXECON multi-pollutant control system and accessories and achieve:

- 90% mercury removal from flue gas through activated carbon injection,
- evaluate the potential for 70% SO_2 control and trim control of NO_x from flue gas through sodium-based or other novel sorbent injection,
- reduced PM emissions through collection by the TOXECON baghouse,
- recovery of 90% of the mercury captured in the sorbent,
- 100% of fly ash collected in the existing electrostatic precipitators be available for utilization,
- demonstration of a reliable, accurate mercury CEM suitable for use in the power plant environment,
- successful system integration and optimization of TOXECON operation for mercury and multi-pollutant control.

Scope of Project

The TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90 MW Coal-Fired Boilers Project will be completed in two Budget Periods. These two Budget Periods are:

Budget Period 1: Project Definition, Design & Engineering, Prototype Testing, Major Equipment Procurement, and Foundation Installation.

Budget Period 2: CEM Demonstration, TOXECON Erection, TOXECON Operation, and Carbon Ash Management Demonstration

As indicated by the title, Budget Period 1 initiates the project with project definition activities including NEPA, followed by design, which includes specification and procurement of long lead-time major equipment, and installation of foundations. In addition, testing of prototype mercury CEMs will be conducted.

Following in Budget Period 2, the TOXECON system will be constructed and operated. Operation will include optimization for mercury control, parametric testing for SO_2 and NO_x control, and long-term testing for mercury control. The mercury CEM and sorbent regeneration processes will be demonstrated in conjunction with the TOXECON system operation.

Each task is described in the Statement of Project Objectives (SOPO) that is part of the Cooperative Agreement. For reference in this and future quarterly reports, the original SOPO for this project can be found in Appendix A.

EXPERIMENTAL

None to report.

RESULTS AND DISCUSSION

Task 4 – Balance of Plant (BOP) Engineering

Design work continued this quarter on the baghouse, fans, dampers and ash handling system. Major efforts during this period were in the following areas:

Review of baghouse vendor General Arrangement Drawings (GA's), flow diagrams, and single lines.

C&B preparation of TOXECON Project GA's, initial issue completed 31 Aug 04. The equipment layout included the location of ash silo, the PAC (Powdered Activated Carbon) equipment, fan room, electrical equipment, DCS cabinets, and air compressor within the available site area for the project.

Foundation design in progress.

Preparation of TOXECON P&ID's – Flue Gas 100% complete, Air 30% complete, Ash 20% complete.

Electrical Systems Load study completed and design in progress.

Additional electrical work included the specification for installing the CEMS from We Energies Port Washington Power Plant, preparation of electrical single lines and preliminary Load List.

Design completed on isolation dampers, static mixer and expansion joints.

Started design on air compressor and air dryer.

PAC System design in progress.

Control engineering work including DCS continued with the location of test ports, definition of I/O for the project, and defining field instrumentation required.

Task 5 – Process Equipment Design and Major Equipment Procurement

The following major equipment contract packages were awarded during this period.

DCS equipment awarded	Sep 04
Dampers were awarded	2 Aug 04
ID booster Fans preawarded	Sep 04
Foundation installation was awarded	17 Sep 04

Unit 7 Damper tie-in package was awarded Sep 04
Ash system awarded 30 Sep 04

Design work continued this quarter with the award of the baghouse and selection of fan, damper and ash handling suppliers. Major efforts during this period were in the following areas:

Structural Steel and ductwork design was initiated during this period.

Ductwork and support steel design bid drawings and bid packages completed. IFB (Issue for Bid) date 24 Sep 04

Ash silo and ash handling systems specification and drawings prepared. IFB specification, 16 Jun 04, Ash silo and ash handling system bid evaluations 75% complete. Four bidders responded.

ID Booster Fan specification prepared and Bid received 28 Jul 04. Bid evaluation for the three ID booster fans completed. Preawarded Sept 2004.

Ductwork Dampers package was sent out for bids; six bidders responded and an award was made to Wahlco.

ID Booster Fans package was issued for bid and 3 bidders responded. Award made to Flakt Woods for 3 fans.

The award for the ash system was made on Sep 30 2004.

Foundation design was issued for bid with 3 bidders responding. Award made to Boldt for the foundation work.

The Unit 7 tie-in damper work was issued for bids with 3 bidders responding. The damper installation was required because Unit 7 is having their outage at this time, so early delivery of the damper required. Awarded to Jamar for installation. *Note: this work was originally planned for Budget Period 2, but was allowed per agreement with DOE NETL to be conducted during Budget Period 1.

A bid package was prepared by C&B for each item of equipment. Important design features, performance requirements, functional characteristics, and specifications are presented in Appendix A. Also included in the Appendix is an overview of the important factors that went into evaluating and selecting the vendors.

Task 6 – Prepare Construction Plan

Work on the construction plan and quarterly reports is currently underway. A detailed schedule has been developed along with a budget monitoring report to monitor construction progress. We expect to issue this report during the next reporting quarter.

Task 7 – Procure Mercury Continuous Emission Monitor (CEM) Package and Perform Engineering and Performance Assessment

Activities under Task 7 will be performed in both Budget Periods 1 and 2.

Field evaluation of CEM components was conducted at two sites and two more sites were identified for the next series of testing. A summary of the test sites, the components tested and the developmental stage of the components are presented in Table 1. The four development stages are:

1. Prototype – laboratory tested, but first time in the field
2. Alpha – field tested, but still requires development on major issues (current research grade)
3. Beta – most of the bugs have been worked out, but still troubleshooting and conducting long term testing for commercial applicability
4. Commercial – Production grade component that can be purchased from the supplier

Test Site	Test Dates	Fuel/Configuration	Components Tested and Development Stage
Sunflower Electric Holcomb Station	July and August 2004	PRB/Spray Dryer and Fabric Filter	Extraction Probe - Alpha Analyzer - Alpha Calibrator - Prototype
Unidentified high sulfur site	August 2004	High sulfur, high ammonia, high temperature flue gas	Analyzer - Alpha Converter - Prototype
Ameren's Meramec Station	October 2004	PRB/ESP	Extraction Probe - Beta Analyzer - Beta Calibrator - Alpha Converter - Prototype
U.S. Gen's Brayton Point	October – December 2004	Low sulfur Bituminous/ ESP	Extraction Probe - Beta Analyzer - Beta Calibrator - Alpha Converter - Prototype
We Energies Presque Isle	January – September 2005	PRB/Hot-Side ESP	Extraction Probe - Beta Analyzer - Beta Calibrator - Beta Converter - Beta

Progress is being made on all of the components. ADA-ES evaluates the components and provides feedback on operational or performance problems to Thermo Electron (Thermo). In general, the test sites are chosen to coincide with other mercury measurement testing. This

allows for real-time comparison of the new components. The exception to this is the Brayton Point site. Thermo received permission to install and test components at Brayton Point. This plant is close to the Thermo complex, which will make it more efficient for Thermo to quickly pre-test components in flue gas.

The beta versions of the analyzer and extraction probe will be delivered to the Meramec Station in October. Beta components will be built using Thermo's C-Series CEM platform with standard C-Series I/O capabilities.

In preparation for installation of the complete beta instrument at Presque Isle, a CEM shelter was procured and will be installed near the Unit 8 outlet duct in November. When the CEM is installed, the goal is to gather outlet mercury emission data prior to beginning testing of the TOXECON unit.

New information about the components became available during this reporting period. With the current design, the system will consist of the five rack-mountable components shown in Figure 1, an extraction probe and umbilical. These components are described below.

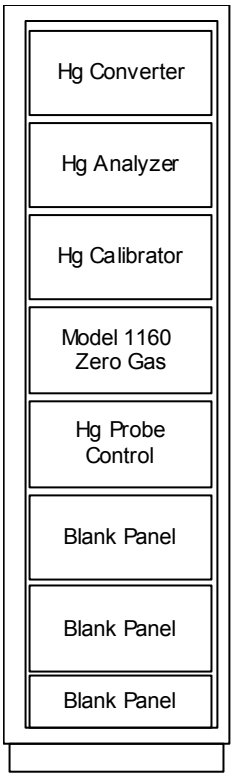

Figure 1. Example of Thermo Electro Mercury CEM rack components.

In Stack Probe and Inertial Filter

The extraction probe uses an inertial filter to produce a particulate-free vapor-phase sample while minimizing the interactions with fly ash, which can cause sampling artifacts. All components that are exposed to sample gas are glass coated to prevent reactions with

mercury. The probe incorporates a dilution assembly. Calibration gas can be introduced either upstream of downstream of the inertial filter.

Probe Control Box

The probe control box is located in the CEM shelter. An umbilical connects the probe to the probe control box and mercury converter. A photograph of the prototype control box is shown in Figure 2. The unit is expected to:

- Allow dynamic Hg spiking and auto dilution confirmation
- Have automatic probe calibration and dynamic spiking via Calibrator Microprocessor
- Have automatic blowback via Calibrator Software

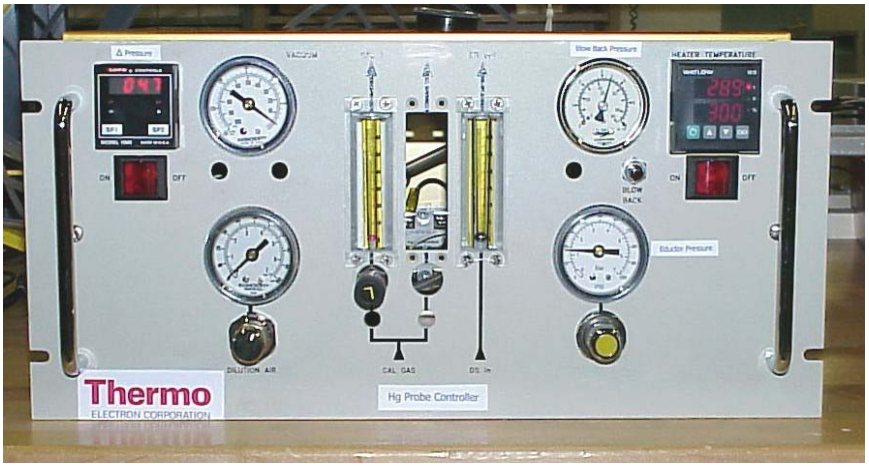

Figure 2. Thermo Electron Model Prototype Probe Control Box.

Sample Transport

Field testing has been conducted with both heated and unheated PFA tubing for sample transport. Tests are underway in a variety of flue gases to determine the required sample transport-line material and temperature.

Mercury Converter

The mercury converter is designed to convert all vapor-phase species of mercury to elemental mercury for measurement. Laboratory test results are promising.

Mercury Analyzer

The mercury analyzer detector is based upon atomic fluorescence. The lower detection limit of the prototype design is 0.5 ng/m^3. A photograph of the mercury analyzer during a recent field trial is shown in Figure 3.

Figure 3. Thermo Electron Mercury Analyzer during field testing.

Mercury Calibrator

The elemental mercury calibrator was developed using a Peltier cooler/vapor pressure control and mass flow controllers. The calibration range is currently 0.1 μg/m^3 to 300 μg/ m^3. This range allows the operator to directly calibrate the analyzer at post-dilution concentrations and dynamically spike into the extraction probe. A photograph of the analyzer and calibrator during a recent field trial is shown in Figure 4.

Figure 4. Thermo Electron Calibrator and Analyzer during field testing.

Zero Air Supply (1160)

The Thermo Electron mercury analyzer is designed for use with a dilution probe. The zero air supply provides dry, mercury-free dilution air to the probe, zero gas for analyzer calibrations, and air to the mercury calibrator. A photograph of the Model 1160 zero gas supply is shown in Figure 5.

Figure 5. Thermo Electro Model 1160 Zero Gas Generator.

Task 8 – Mobilize Contractors

CaTS, the project construction manager, began their mobilization on June 28, 2004, and were fully mobilized in the month of July. Initial field pre-construction work began with the demolition and relocation of an existing parking lot away from the construction site.

CaTS is located at the Presque Isle Power Plant site in a trailer and is proceeding with managing the field construction work. Staff at this time includes the Construction Manager, Construction engineer, an administrative clerk, and three engineers from We Energies for field support of the mechanical and electrical contract work.

Preliminary fieldwork, prior to subcontractors mobilizing on the site, were the building of a parking lot with access roads and lighting for the contractors on the We Energies site. Trailer locations were established and temporary power installed.
We Energies parking lot completed – 33,000 sq ft paved
Craft parking lot completed – 77,000 sq ft stoned

The foundation contractor, Boldt, was mobilized in September.
The Unit 7 tie-in damper contractor, Jamar, was mobilized Sept 28 and planned to complete the work in early November. *Note: this work was originally planned for Budget Period 2, but was allowed per agreement with DOE NETL to be conducted during Budget Period 1.

Task 9 – Foundation Erection

Boldt was selected and mobilized 9 Sep 04. Work began with dewatering and then demolition of the parking lot concrete and perimeter sheet piling. The following work has just begun:
Dewatering System installed for Baghouse area
Demolition complete
Perimeter pile driving 50% complete
Foundation work 10% complete

Task 17 – Carbon-Ash Management System

The goal of this task is to evaluate the viability of integrating existing technologies into a system that would recover mercury from the ash/sorbent mixture collected in the fabric filter.

A preliminary survey of available technologies was conducted under Subtask 17.1 (Evaluate Options and Pilot Test Carbon-Ash Management System).

These technologies include:

- Dominion Ash's Microwave Combustion Technology. The technology is based on Selective Microwave Pyrolysis (SMP) and would be used to thermally release

mercury from the ash/sorbent mixture. Dominion is designing a portable test system that could be evaluated at Presque Isle.

- ADA Technologies' Reactive Scrubber Technology. Once mercury is released from the ash/sorbent mixture, it will have to collected and changed into a form of mercury that is stable and disposable. ADA Technologies is working on a reactive scrubber that coverts elemental mercury to meta-cinnabar (HgS) through a reaction with sulfur intense mixing.
- A proprietary process developed by We Energies.

Task 19 – Reporting, Management, Subcontracts, Technology Transfer

Under this tasks reports, as required in the Financial Assistance Reporting Requirements Checklist and this Statement of Project Objectives are prepared and submitted. Non-proprietary technical progress reports are distributed among team members to keep the team informed on the project status. Subcontract management, communications, outreach, and technology transfer functions are also performed under this task.

Items Delivered During the Quarter

- Quarterly Technical Progress Report
- Quarterly Financial Status Report
- Quarterly Federal Assistance Program/Project Status Reports

- DOE Kickoff Meeting. provided background and a status of the project. Held at DOE Morgantown, with DOE, We Energies, C&B, and ADA-ES in attendance.

- A technical presentation about the project was given to the Clean Coal Generation meeting (Denver, CO, September 8, 2004).

During the quarter, the team members worked on updating the project budget. Four components were budgeted: We Energies, C&B/CaTS, ADA-ES, and equipment. The budget will be finalized during the next reporting quarter. The updated budget will be used to prepare an updated cost plan.

A no-cost time extension was requested by We Energies to extend the Budget Period 1 ending date from November 30, 2004 to February 28, 2005. This was granted by DOE/NETL.

CONCLUSION

This is the second Technical Progress Report under Cooperative Agreement No. DE-FC26-04NT41766. Work continued in the TOXECON system design and engineering. Procurement of several major items of equipment was also done during the quarter. Work continued in the evaluation of components for a mercury continuous emissions monitor system.

REFERENCES

None this reporting period.

Appendix A -
Bid Evaluation Overview

Baghouse Bid Evaluation

Specifications

Specification 4937M1 requested one (1) pulse jet fabric filter baghouse for the combined flow of Presque Isle Units 7, 8 and 9. The basic design characteristics for the fabric filter baghouse are listed below:

Flue Gas Flow	1,200,000 ACFM
Flue Gas Temperature	350°F
Gross A/C ratio	5.5
Number of Compartments	10 to 14
Bag Material	PPS, 2.7 denier, 18 oz/sq. yd.
Inlet Particulate loading	0.063194 gr/acf
Outlet Particulate loading	0.002756 gr/acf

The specification defined the turnkey scope of work from the inlet flange to the outlet flange of the baghouse excluding civil, foundation and portions of the electrical work.

Baghouse Technical Evaluation Criteria

General Arrangement
Air to Cloth Ratio
Number of Compartments
Bag Material, Length, and Bag Cages
Bag Attachment Method
Pulse Cleaning System

Commercial Evaluation Criteria

Terms and Conditions
Guarantees and Warranties

Economic Cost Criteria

Total Price
Pressure Drop
Compressed Air Usage

Intangible Criteria

COHPAC and PAC Experience

Booster Fan Evaluation

Specifications

Specification 4937M2 requested booster fans to accommodate the increased pressure drop associated with a new baghouse addition and the associated ductwork system for the TOXECON Retrofit Project at Presque Isle Units 7, 8 and 9. The basic scope of supply for the booster fans is listed below:

(3) Booster fans with radial variable inlet vanes, complete with motors, and lube oil systems, as noted in specification 4937M2.

Three options were requested in addition to the standard scope of supply:

- Buyer's Option 1: In lieu of constant speed motors and variable inlet vanes, provide inverter-duty motors with variable frequency drives (VFD's).
- Buyer's Option 2: In lieu of Seller's standard inlet vane positioner, provide electro-hydraulic positioners as manufactured by REXA Electronic.
- Buyer's Option 3: Provide a vibration monitoring system in lieu of vibration sensors.

Specification 4937M2 defined a scope of material supply. Installation of the booster fans will be assigned to the Erection Contractor.

Booster Fan Technical Evaluation Criteria

Motor Horsepower
Fan Efficiency at Net Conditions
Inlet Dampers
Turndown Capability
Fan Hub Design
Variable Inlet Vanes
Fan/Motor Coupling
Adherence to Vibration Standard

Commercial Evaluation Criteria

Terms and Conditions
Guarantees and Warranties

Economic Cost Criteria

As-Bid Pricing vs. Evaluated Cost
Fan Efficiencies

Intangible Criteria

Experience with Comparable Projects

Damper Evaluation

Specifications

Specification 4937M4 requested ductwork isolation dampers for Boiler Unit isolation and Booster Fan isolation for the TOXECON Retrofit Project at Presque Isle Units 7, 8 and 9. The basic scope of supply for the isolation dampers is listed below:

- (9) Unit Isolation, Guillotine Dampers
- (6) Booster Fan Inlet Isolation, Guillotine Dampers *
- (3) Booster Fan Outlet Isolation, Guillotine Dampers *

An alternative bid was requested to provide flap dampers in lieu of the guillotine dampers for the Boiler Unit isolation function.

- (6) Unit Isolation, 3-port Flap Dampers
- (6) Booster Fan Inlet Isolation, Guillotine Dampers *
- (3) Booster Fan Outlet Isolation, Guillotine Dampers *

* The booster fan isolation damper sizes were based on preliminary information since the fans were not purchased at the time. The fan damper sizing and pricing will require adjustment after the fans have been purchased.

The specification defined a scope of material supply. Installation of the dampers will be assigned to the Erection Contractor.

Damper Technical Evaluation Criteria

Guillotine field Assembly
Guillotine Blade Design
Guillotine Seal Design
Guillotine Corrosion Protection
Guillotine Drive Train
Pressure Drop (Guillotine vs. Flap)
Flap Damper Comparisons

Construction Evaluation Criteria

Installation Cost
Method of Interface

Commercial Evaluation Criteria

Terms and Conditions
Guarantees and Warranties

Economic Cost Criteria

Fan Costs
Seal Air and Heat Tracing Power Consumption
Duct Work Costs
Field Assembly
Round to Square Transitions
Building Modifications

Intangible Criteria

Experience with Comparable Projects

Ash Handling System Evaluation

Specifications

Specification 4937M3 requested an ash handling system to collect, store and transfer the fly ash /powder activated carbon (PAC) mixture that will be collected in a new fabric filer baghouse for the TOXECON Retrofit Project at Presque Isle Units 7, 8 and 9. This fly ash/carbon mixture will be collected from the baghouse hoppers and transferred to a fly ash/carbon silo. The fly ash/carbon will then be unloaded from the silo using the wet unloading system and transported by open bed truck to a landfill. The dry unloading system will be used to recycle the ash carbon in the mercury removal process by unloading into a truck and returned to the carbon storage silo.

The basic scope of supply for the ash handling system is listed below:

- Intake from Baghouse Hoppers
- Conveying pipe to Storage Silo
- Filter and Separating equipment
- Storage Silo
- Wet and Dry Unloading systems

The specification defined a scope of material supply. Installation of the ash handling system will be assigned to the Erection Contractor.

Ash Handling System Technical Evaluation Criteria

Silo Arrangement
Silo assembly
Air to Cloth Ratio
Aeration
System Operation and Maintenance
Wet Unloader
Conveying Pipe
Valves
Controls

Commercial Evaluation Criteria

Terms and Conditions
Terms of Payment

Economic Cost Criteria
Steel Escalation Factors

Intangible Criteria
Experience with Comparable Projects

Substructure Evaluation

Specifications

Technical Specification 4937S1 requested a firm price, lump sum bid to perform all necessary excavation, dewatering, spoil removal, foundation construction, back fill and restoration of the affected areas. This work needs to be completed to close out Budget Period #1 of the TOXECON Project.

Economic Cost Criteria

Overall Price

Intangible Criteria

Experience with Comparable Projects
Construction Methods

Appendix B -
Statement of Project Objectives

The primary goal of this project is to reduce mercury emissions from three 90 MW units at the We Energies Presque Isle Power Plant. Additional goals are to reduce nitrogen oxide (NO_x), sulfur dioxide (SO_2), and particulate matter (PM) emissions, allow for reuse and sale of fly ash, develop and demonstrate a reliable mercury continuous emission monitor (CEM) suitable for use in the power plant environment, and demonstrate a process to recover mercury captured in the sorbent. To achieve these goals, We Energies (the Participant) will design, install, and operate a TOXECON™ (TOXECON) system designed to clean the combined flue gases of units 7, 8, and 9 at the Presque Isle Plant.

TOXECON is a patented process in which a fabric filter system (baghouse) installed down stream of an existing particle control device is used in conjunction with sorbent injection for removal of pollutants from combustion flue gas. The flue gas emissions will be controlled from the three units using a single baghouse. Mercury will be controlled by injection of activated carbon or other novel sorbents, while NO_x and SO_2 will be controlled by injection of sodium based or other novel sorbents. Addition of the TOXECON baghouse will provide enhanced PM control. Sorbents will be injected downstream of the existing particle collection device to allow for sale and reuse of captured fly ash, uncontaminated by activated carbon or sodium sorbents.

Methods for sorbent regeneration, i.e. mercury recovery from the sorbent, will be explored and evaluated. Components available for use will be evaluated and the best available will be integrated into a mercury CEM suitable for use in the power plant environment. This demonstration will provide for the use of a novel multi-pollutant control system to reduce emissions of mercury and other air pollutants, while minimizing waste, from a coal-fired power generation system.

A. Project Objectives

The specific objectives of this project are to demonstrate the operation of the TOXECON multi-pollutant control system and achieve:

- 90% mercury removal from flue gas through activated carbon injection,
- evaluate the potential for 70% SO_2 control and trim control of NO_x from flue gas through sodium-based or other novel sorbent injection,
- reduced PM emission through collection by the TOXECON baghouse,
- recovery of 90% of the mercury captured in the sorbent,
- 100% of fly ash collected in the existing electrostatic precipitator available for utilization,
- demonstration of a reliable, accurate mercury CEM suitable for use in the power plant environment,
- successful system integration and optimization of TOXECON operation for mercury and multi-pollutant control.

The participant will design and construct a TOXECON multi-pollutant control system as a retrofit to three 90 MW coal-fired boilers at the Presque Isle Power Plant. The objectives

will be achieved through injection of various sorbents into the flue gas stream to capture mercury, SO_2, NO_x, and other air toxics as appropriate. Efforts will be focused on development and demonstration of two ancillary technologies, a mercury continuous emission monitor and a method of treating the captured activated carbon sorbent for regeneration or for reuse in the system rather than disposal. The demonstration project will provide the utility industry a benchmark for cost and performance of a commercial scale mercury control systems for application on coal-fired power generation systems.

B. Scope of Project

The TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90 MW Coal-Fired Boilers Project will be completed in two Budget Periods. These two Budget Periods are:

Budget Period 1: Project Definition, Design& Engineering, Prototype Development, Major Equipment Procurement, and Foundation Installation.

Budget Period 2: CEM Demonstration, TOXECON Erection, TOXECON Operation, and Carbon Ash Management Demonstration

As indicated by the title, Budget Period 1 will initiate the project with project definition activities including NEPA, followed by design, which includes specification and procurement of long lead-time major equipment, and installation of foundations. In addition, prototype development for mercury CEM and sorbent regeneration processes will be conducted.

Following in Budget Period 2, the TOXECON system will be constructed and operated. Operation will include optimization for mercury control, parametric testing for SO_2 and NO_x control, and long term testing for SO_2 and NO_x control. The mercury CEM and sorbent regeneration processes will be demonstrated in conjunction with the TOXECON system operation.

C. Tasks to be Performed

(The Participant will work directly with the company identified in the parentheses)

Budget Period I: Project Definition, Design& Engineering, Prototype Development, Major Equipment Procurement, Foundation Installation, and Management & Reporting.

Task 1 - Design Review Meeting (ADA-ES)

The project team will hold a kickoff, design review meeting including the participant, the DOE Contracting Officer's Representative (COR), major subcontractors, and other project team members as appropriate to discuss the project, system hardware components, costs, and

schedules. This meeting will take place within sixty days after award with the primary purpose of providing a status of the ongoing work, specifying system requirements and planning future project activities.

Task 2 – Project Management Plan (ADA-ES)

An updated Project Management Plan will be prepared as a deliverable within 30 days following the Design Review Meeting. This plan will be updated based on information provided at the Design Review Meeting held under Task 1. The plan will be suitable for use in tracking project progress at the task level using the earned value management system and will include the following information.

- Final Work Breakdown Structure. A final Work Breakdown Structure will be prepared that identifies Tasks and Subtasks to be performed under the project.
- Final Statement of Project Objectives. A final Statement of Project Objectives will be prepared that describes the work to be performed under the project at the Task and Subtask level of detail, following the format of the Work Breakdown Structure.
- Schedule Baseline. A Schedule Baseline will be prepared in Gantt Chart format that shows the project schedule for the entire project at the Task level of detail, including major milestones and decision points. The Schedule Baseline will follow the Task structure of the Work Breakdown Structure.
- Cost Baseline. A Cost Baseline will be prepared showing projected monthly total project cost as a function of Task, following the format of the Work Breakdown Structure.
- Technology Baseline. A description of the Baseline Technology will be prepared, including a summary of technology experience and applications, design issues to address as identified in the Design Review Meeting, mass balances, and identification of major equipment.
- Management Controls. An updated listing of key organizations and individuals involved with the project, functions and authorities of each, lines of authority, procedures used to control cost expenditures, and technical decision making procedures.

Task 3 –Provide NEPA Documentation, Environmental Approvals Documentation and Regulatory Approval Documentation (ADA-ES)

The Participant will provide a completed Environmental Information Volume and other information to DOE and any DOE authorized subcontractors necessary to allow completion of the Environmental Assessment required for compliance with the National Environmental Policy Act (NEPA). The Participant will provide documentation to DOE demonstrating that the participant has the necessary approvals from appropriate environmental regulatory bodies to proceed with the project. The Participant will provide any rulings received from state public utilities commissions regarding this project to DOE.

Task 4 – Balance of Plant (BOP) Engineering (C&B)

In addition to the major process equipment, ductwork and distributed control systems (DCS) described herein, a substantial balance of plant engineering and design effort is required. The Participant will provide BOP engineering and design necessary for the construction, installation, and operation of the TOXECON technology. The Participant will subject the BOP design to standard engineering review and acceptance procedures. The BOP engineering and design scope includes the following items.

- Demolition, excavation, underground utility relocation design.
- Baghouse arrangement and plant equipment general arrangement design.
- Foundation design.
- Civil, structural and ductwork design.
- Baghouse and building enclosure design.
- Mechanical design, including fans, ductwork, dampers, sorbent handling silo, and air compressors.
- Electrical system study, motor control center (MCC) and electrical design.
- Plant controls and instrumentation design and CEM design.
- Piping and instrumentation diagrams, and piping design for carbon, water, air, sorbent/ash, and flue gas subsystems.
- Water injection skid system design.
- Carbon injection skid systems design.

For each BOP design item the participant will provide a definition of design scope, appropriate drawings, specifications, and instructions sufficient for the construction, installation, and operation of TOXECON system. The participant will subject the BOP design to standard engineering review and acceptance procedures.

Task 5 – Process Equipment Design and Major Equipment Procurement (C&B)

The Participant will provide expertise in the development of the final design and specifications for the TOXECON technology. Major equipment bid packages will be prepared and awarded in this task.

Subtask 5.1 - Process Equipment Design

The Participant will provide a design for the TOXECON system to be installed on at the Presque Isle Plant. The Participant will provide the final design and specifications for the baghouse and sorbent injection system, which are the major components that must be integrated in the TOXECON technology. The baghouse will be capable of processing the combined flue gases of Units 7, 8, and 9 at the Presque Isle Plant. The baghouse will be capable of filtering activated carbon sorbent and other sorbents used in the TOXECON system, and shall be sized appropriately such that sufficient sorbent can be injected to meet project pollution reduction goals as stated in Section A, Project Objectives. The sorbent injection system will be capable of injecting activated carbon and other sorbents in sufficient quantity to meet project pollution

reduction goals. Performance data from ongoing, non-commercial demonstrations will be included in the design as appropriate. Flow modeling will be performed to confirm design parameters. Process instrumentation necessary to track performance will be specified.

Subtask 5.2 - Major Equipment Procurement

Formal specifications and bid packages will be prepared, negotiated and awarded as appropriate. Equipment packages include: baghouse, demolition and underground work, foundation, mechanical and steel, electrical and controls, sorbent silo and sorbent handling system, ID fans and motors, and air compressors.

Task 6 – Prepare Construction Plan (C&B)

The Participant will develop a Construction Plan that identifies and describes all crucial activities required for an on-time completion of the design, procurement, construction, and start-up phases of the project. The Construction Plan will include a Project Plan that will specify material types and quantities, labor craft requirements, and schedules necessary for the successful construction of the TOXECON system. The Construction Plan will also include a detailed Gantt Chart that will identify design, procurement, construction, and start-up activity schedules with all critical path items and milestones identified. The Construction Plan Gantt Chart will be used to coordinate activities among subcontractors, and to track progress of activities against a baseline schedule to assist in maintaining the project schedule.

Task 7 – Procure Mercury Continuous Emission Monitor (CEM) Package and Perform Engineering and Performance Assessment (ADA-ES)

Mercury CEM components will be selected and procured. The Participant will assess the suitability of commercially-available equipment to the needs of this program. The Participant will evaluate mercury CEM components and incorporate the various components into a fully functional mercury CEM capable of measuring mercury content of a coal-fired flue gas stream suitable for evaluating performance of the TOXECON system. The mercury CEM should allow for automated operation, requiring only periodic operation and maintenance by plant operating personnel. It is a goal of this program to work with suppliers to significantly improve reliability and decrease operations and maintenance requirements of currently available mercury CEM devices. Two subtasks will be performed in Budget Period 1.

Subtask 7.1 - System Design, Evaluation and Analysis (Laboratory and Field)

The Participant will evaluate mercury CEM components including the extraction, detector, calibration, sample transport, conversion and separation, and control and data management subsystems. The participant will survey existing components for availability and suitability for integration into a mercury CEM system. The

participant will perform laboratory and/or field testing as appropriate of each individual subsystem to determine its suitability based on criteria stated above. The Participant will procure suitable components for system integration testing.

Subtask 7.2 - System Integration and Testing

The participant will integrate components procured in Subtask 7.1 into an operational mercury CEM device. The Participant will perform necessary laboratory evaluations and system check out procedures to ensure proper operation and suitability prior to field evaluations. The Participant will develop written operating instructions for the mercury CEM system and an evaluation plan, including performance criteria, to assess mercury CEM system performance.

The Participant will perform a field evaluation at a coal-fired power generation facility to assess the performance of the mercury CEM against criteria established above according to the evaluation plan identified above.

Task 8 – Mobilize Contractors (C&B)

The Participant will mobilize contractors based on the project schedule in accordance the Construction Plan developed under Task 6. These include construction management, demolition and excavation, mechanical, electrical, and foundation contractors. Mobilization is the first step in granting authorization for contractors to initiate work. Mobilization includes installing temporary construction infrastructure required before crews arrive on site, hiring personnel and subcontractors, and developing a utilization plan for large equipment including cranes.

Task 9 – Foundation Erection (C&B)

After all required demolition work, relocation of below grade equipment, and earthwork has been completed; foundations for all major equipment will be installed. Work will be performed in accordance with design specifications developed under Tasks 4 and 5, and in accordance with the Completion Plan developed in Task 6.

The existing paved parking lot and other existing structures as required will be demolished and scrap material will be disposed of in an appropriate manner. Excavation will be performed to expose below grade equipment and utilities, including, storm pipe, trench drains, fire suppression water, and water as appropriate. These utilities will be relocated to allow for installation of the TOXECON system. New below grade utilities required for installation and operation of the TOXECON will be installed. General excavation will be performed to prepare for construction of foundations for all major pieces of equipment. Concrete foundations will be installed for the baghouse, sorbent injection equipment, water injection skids, and other equipment as required for the installation and construction of the TOXECON system. Roads disturbed during foundation erection will be restored, suitable for supporting access to plant operations. Large equipment will be deployed as required by the Large Equipment Deployment Plan developed in Task 8.

Task 17 – Carbon-Ash Management System (ADA-ES)

Subtask 17.1 - Evaluate Options and Pilot Test Carbon-Ash Management System

The Participant will evaluate the viability of a mercury recovery system for the purpose of recovering mercury from the sorbent/ash mixture and allowing for beneficial reuse of this product. The Participant will also evaluate the processed sorbent for potential reuse. This may also allow the sorbent to be recycled in the TOXECON system. Activities to be performed under this budget period will include the following. The Participant will perform a survey to identify potential technology options. From these options, a technology will be chosen for further study. The Participant will evaluate the viability of the system and approach through engineering analysis and laboratory and/or pilot scale testing.

Task 19 – Reporting, Management, Subcontracts, Technology Transfer (ADA-ES)

The Participant will employ standard project management techniques for the purpose of keeping all activities on schedule and within the budget. Activities performed under this task will be used to provide oversight and control throughout execution of the project during Budget Period 1. The Participant will hold team meetings with attendance required from the organizations most involved during the active phase of the project to facilitate communication and enable the appropriate technical input into all activities.

The Participant will prepare and submit reports as required in the Financial Assistance Reporting Requirements Checklist and this Statement of Project Objectives. The Participant will report data such that earned value management techniques can be used to evaluate progress of Tasks under Budget Period 1. Non-proprietary technical progress reports will be distributed among team members to keep the team informed on the project status. Subcontract management, communications, outreach, and technology transfer functions will also be performed under this task.

Budget Period II: CEM Demonstration, TOXECON Erection, TOXECON Operation, Carbon Ash Management Demonstration, and Management & Reporting.

Task 7 – Procure Mercury CEM Package and Perform Engineering and Performance Assessment (ADA-ES)

Subtask 7.3 – Mercury CEM Design, Component Integration, and Field Testing

Efforts to develop a Mercury CEM will continue in Budget Period 2. Tasks in this period will focus on integrating components, field testing, and final design issues that have not been addressed in Subtask 7.2. Based on testing performed in Budget Period 1, overall system performance and performance of individual system components will be evaluated. Redesign of the system and individual components will be performed as required. Appropriate modifications, including acquisition and integration of new

components will be made to the prototype device to address system deficiencies. Further laboratory evaluations, system check out, and field evaluations will be performed as required. The prototype monitor will be installed on the TOXECON system.

Task 10 – Erect Structural Steel, Baghouse and Ductwork (C&B)

The Participant will construct and install structural steel, ductwork, a sorbent injection system and a baghouse necessary for the operation of the TOXECON mercury removal and multi-pollutant control system. The Participant will construct and install equipment specified and procured in Task 5 in accordance with designs developed in Tasks 4 and 5. Activities will be performed in accordance with the Completion Plan developed in Task 6.

The Participant will install structural steel necessary to support the multi-level duct arrangement, baghouse, induced draft fan enclosure, access and instrumentation supports, sorbent silo, and all other equipment necessary for operation of the TOXECON system.

Stiffened plate steel ductwork will be installed that allows flue gas from Presque Isle Units 7, 8, and 9 to enter the TOXECON baghouse or exit directly to the existing stack. Ductwork will also be installed to carry flue gas from the TOXECON baghouse, which will transition from a single duct into three, each with an induced draft fan, to carry flue gas to existing independent outlet ducts for Units 7, 8, and 9.

The Participant will install a baghouse to filter the combined flue gas streams of Units 7, 8, and 9 at the Presque Isle Plant. The baghouse shall be capable of filtering activated carbon sorbent and other sorbents used in the TOXECON system, and shall be sized appropriately such that sufficient sorbent can be injected to meet project pollution reduction goals as stated in Section A, Project Objectives.

The Participant will install steel platforms to serve as working surfaces allowing performance of standard maintenance on equipment and access to test ports and probes. These areas include access inside the existing powerhouse to the exhaust duct water injection ports, if required, and access to baghouse inlet duct and outlet duct.

Task 11 – Balance of Plant Mechanical and Civil/Structural Installations (C&B)

The Participant will construct and install mechanical balance of plant equipment necessary for operation of the TOXECON system according to designs developed in Task 4 and 5, including equipment specified and procured under Task 5. Activities will be performed in accordance with the Completion Plan developed in Task 6. Balance of plant mechanical installations will include the following:

- Baghouse and duct insulation and lagging
- Hopper, fan, and silo enclosures and siding
- Sorbent/Ash vacuum exhauster skids and enclosure
- Piping, valves, support, and accessories

- Sorbent/Ash silo and unloading equipment
- Induced draft fans
- Instrument air and controls system
- Carbon injection system
- Unit tie-ins
- Heating, ventilation, air conditioning, fire protection, and support systems
- Water injection system
- Miscellaneous guard post and guardrails

Task 12 – Balance of Plant Electrical Installations (C&B)

The Participant will install balance of plant electrical equipment necessary for operation of the TOXECON system according to designs developed in Task 4 and 5, including equipment specified and procured under Task 5. Activities will be performed in accordance with the Completion Plan developed in Task 6. Balance of plant electrical installations will include the following:

- Baghouse Power Supply
- Three MCC's
- ID Fan Power Supply
- Auxiliary Electrical Supply
- Baghouse Control Cable
- ID Fan Control Cable
- Auxiliary Equipment Control Cable
- CEMS System
- DCS System
- Freeze Protection System
- Lighting system

Task 13 – Equipment Pre-Operational Testing (C&B)

Prior to start-up of TOXECON, each major and minor piece of equipment will be powered up and tested to assure that operation meets performance specifications. This includes all fans, blowers, compressors, support instrumentation, control systems, valves, dampers, and plant tie-ins. Pre-operation testing will include:

- ID Fan startup and checkout
- Baghouse systems startup and checkout
- Air compressor checkout
- Carbon injection system checkout
- Sorbent/Ash handling system checkout
- Water Injection system checkout
- Instrument and controls systems checkout
- DCS programming checkout

- CEMS system checkout
- Electrical systems checkout

Task 14 – Start Up and Operator Training (C&B)

The Participant will devote sufficient time to allow for successful start up and debugging of full system operation. The Participant will conduct operator training during the start-up period. The Participant will develop operating manuals and distribute copies to operating personnel sufficient for training and operation of the TOXECON system. Training will take place in several forms including classroom sessions for all pertinent personnel.

Task 15 – Operate, Test, Data Analysis and Optimize TOXECON for Mercury Control (ADA-ES)

Subtask 15.1 - Test Plan Development

The Participant will develop Test Plans for each major area of investigation. The Participant will develop Test Plans with input from team members as appropriate, and will be subject to review by team members prior to submission to DOE for comment. The Participant will develop test plans for evaluating and optimizing the TOXECON technology including:

- TOXECON Evaluation
- Mercury Recovery
- Mercury CEM

The Participant shall submit a Draft Copy of each Test Plan to the DOE COR for review. The COR shall review each Test Plan and provide comments to the Participant within 30 days of receipt. The Participant shall address comments made by the DOE COR and submit a Final copy of each Test Plan to the DOE COR for approval. The COR will provide approval of each Final Test Plan that fully addresses COR comments within 30 days of receipt. The Participant shall not initiate testing prior to completion of the Test Plan approval process.

TOXECON Evaluation Test Plan. The Participant will develop a Test Plan to evaluate mercury and multi-pollutant control through sorbent injection and a plan to optimize TOXECON operation for maximum mercury and multi-pollutant removal under varying operating conditions. The Test Plan will address the following issues:

- A plan for start-up, optimization, long-term performance monitoring and acceptance testing of TOXECON for mercury control under varying operating conditions. Operating strategies for optimizing mercury control including but not limited to temperature control will be addressed.
- A plan and schedule for monitoring mercury entering TOXECON and mercury emissions, including demonstrating integrated operation of all subsystems and components. A plan and schedule for periodic manual stack

measurements of both particulate matter and mercury. A plan and schedule for measurement of NO_x and SO_2 emission reduction.

- Sorbents and suppliers of sorbents for mercury, NO_x and SO_2 removal will be identified.
- A plan for evaluating fabric filter bags selected for use to determine their suitability for continued testing. Bag integrity through periodic bag strength testing, and measurement of as-received, vacuumed, and in situ bag permeability will be conducted.
- Operating data to be tracked including but not limited to temperature, pressure drop, cleaning frequency, sorbent injection rate, and opacity will be identified.
- A plan for short-term, parametric tests to evaluate alternate activated carbon sorbents and operating strategies.
- A plan for evaluating and optimizing the control of SO_2 and NO_x through sorbent injection under varying operating conditions. A plan for investigating waste disposal and mercury recovery from these sorbents

Mercury Recovery Test Plan. The Participant will develop a Test Plan to evaluate performance of the mercury recovery system developed under Task 17. The Participant will fully evaluate the ability of the chosen system to recover mercury from spent activated carbon sorbent and the feasibility of reuse of the sorbent in the TOXECON system. The plan will include an evaluation of methods for disposing of the mercury captured in the mercury recovery system.

Mercury CEM Test Plan. The Participant will develop a Test Plan to evaluate the performance of the mercury CEM developed under Task 7. The CEM will be evaluated on the full scale TOXECON system. The plan will be designed to evaluate the operability and reliability of the instrument. The plan will be designed to evaluate the accuracy and reproducibility of mercury emission measurements.

Subtask 15.2 - Optimize TOXECON for Mercury Control

The Participant will operate the TOXECON system in accordance with the TOXECON Evaluation Test Plan developed under Task 15.1. The Participant will operate the TOXECON system to evaluate its performance with respect to mercury control as a function of operating variables. The Participant will evaluate the long-term performance of the TOXECON system, and the Participant will perform short term parametric testing to evaluate alternative sorbents and operating strategies. The Participant will measure mercury emission reductions, evaluate filter bag integrity, and track operating data to quantify TOXECON performance as a function of operating conditions.

Subtask 15.3 - Continuous Mercury Measurements

The Participant will operate the mercury CEM to evaluate the operability, reliability, accuracy, and repeatability of the mercury CEM system in accordance with the Mercury CEM Test Plan developed in Subtask 15.1. The Participant will evaluate the performance of

the mercury CEM developed under Task 7 on the full scale TOXECON system. The mercury CEM will be used to evaluate the performance of the TOXECON system for its ability to control mercury emissions.

Task 16 –Operate, Test, Data Analysis and Optimize TOXECON for SO_2 and NOx Control (ADA-ES)

After TOXECON operation and performance is established for mercury control, the Participant will conduct tests to assess the capability of TOXECON to control other pollutants including SO_2 and NOx. Injection equipment and measurement instrumentation will be designed, procured and installed specifically for these tests. The Participant will perform evaluations in accordance with the TOXECON Evaluation Test Plan developed under Subtask 15.1. The Participant will measure NO_x and SO_2 emission reductions and track operating data to quantify TOXECON performance as a function of operating conditions.

Task 17 – Carbon-Ash Management System (ADA-ES)

Subtask 17.2 – Procure Full-Scale Demonstration System and Evaluate Carbon-Ash Management System

Providing results from Subtask 17.1 meet project goals, the Participant will procure a full-scale demonstration unit of the mercury recovery system for testing of the sorbent-ash mixture collected in TOXECON. The Participant will install the mercury recovery system on the TOXECON to allow for continuous removal and processing of the spent sorbent and ash mixture from the TOXECON system. The Participant will perform shakedown testing to ensure proper operation of all subsystems and the integrated system as a whole prior to incorporation into the TOXECON system. The Participant will evaluate the performance of the mercury recovery system as installed on the TOXECON system in accordance with the Mercury Recovery Test Plan developed in Subtask 15.1. The Participant will evaluate the ability of the mercury recovery system to evolve mercury from used sorbent in the presence and absence of NO_x and SO_2 sorbents. The Participant will evaluate the ability of the regenerated sorbent to capture mercury. The Participant will evaluate the methods for disposal of mercury captured in the mercury recovery system. Contingent on successful results, the Participant will provide an assessment of the capital and operating costs of the mercury recovery system and provide a cost/benefit analysis relative to inclusion of this system in the TOXECON system.

Task 18 – Revise Design Specifications, Prepare O&M Manuals (ADA-ES)

The Participant will prepare revisions to specifications based on the as-built installation and actual operating experience of the system. The Participant will prepare revised operating and maintenance manuals based on as-built installation and operating experience.

Task 19 – Reporting, Management, Subcontracts, Technology Transfer (ADA-ES)

The Participant will employ standard project management techniques for the purpose of keeping all activities on schedule and within the budget. Activities performed under this task will be used to provide oversight and control throughout execution of the project during Budget Period 2. The Participant will hold team meetings with attendance required from the organizations most involved during the active phase of the project to facilitate communication and enable the appropriate technical input into all activities.

The Participant will prepare and submit reports as required in the Financial Assistance Reporting Requirements Checklist and this Statement of Project Objectives. The Participant will report data such that earned value management techniques can be used to evaluate progress of Tasks under Budget Period 2. Non-proprietary technical progress reports will be distributed among team members to keep the team informed on the project status. Subcontract management, communications, outreach, and technology transfer functions will also be performed under this task.

D. Deliverables

In addition to the reports identified on Attachment B, the Financial Assistance Reporting Requirements Checklist, and in specific sections of this agreement, the Participant shall provide documents, reports, and briefings as identified below.

Project Management Plan. The Participant shall provide an updated Project Management Plan within 30 days of the Design Review Meeting held under Task 1.

Construction Plan. The Participant shall provide a Construction Plan developed under Task 6.

Test Plans. The Participant shall provide the following Draft Test Plans for review by the DOE COR: Draft TOXECON Evaluation Test Plan, Draft Mercury CEM Test Plan, and Draft Mercury Recovery Test Plan. The Participant shall provide the following Test Plans for DOE approval: TOXECON Evaluation Test Plan, Mercury CEM Test Plan, and Mercury Recovery Test Plan.

Topical Report. The Participant shall submit a Preliminary Public Design Report as a Topical Report for Budget Period 1. The Participant shall submit a Draft Topical Report for Budget Period 1 within 60 days of the conclusion of Budget Period 1. DOE shall review the Draft Topical Report and provide comments to the Participant within 30 days of receipt. The Participant shall address DOE comments and submit a Final Topical Report for Budget Period 1 within 30 days.

Public Design Report. The Participant shall submit a Public Design Report, for the purpose of public use. The Public Design Report must consolidate all design and cost information for the project at the completion of construction and start up. The report must contain sufficient

information to provide an overview of the project, salient design features and data, and the role of the demonstration project in commercialization planning.

E. Briefings

Briefings and Technical Presentations shall be provided as follows.

Kickoff Design Review Meeting. The Participant shall hold a kickoff, design review meeting as, described in Task 1, within sixty days after award with the primary purpose of providing a status of the ongoing work, specifying system requirements and planning future project activities.

Design Review. The Participant shall hold a design review meeting near the end of design activities during Budget Period 1 for the purpose of presenting a review of the design process and salient design features of the TOXECON System.

Final Briefing. The Participant shall provide a Final Briefing at the conclusion of the project to provide a comprehensive summary of the accomplishments and results of this project. The location of the Final Briefing shall be Morgantown, WV.